

WHAT IS CLAIMED IS:

1. An ink jet recording head comprising:
a nozzle for jetting ink;
an ink chamber communicating with said nozzle;
a diaphragm for pressurizing ink in said ink chamber;
a piezoelectric thin film on said diaphragm; and
an electrode for said piezoelectric thin film wherein
said piezoelectric thin film and said electrode are patterned
to the same shape.
2. The ink jet recording head according claim 1,
wherein both of said piezoelectric thin film and said
electrode are etched at the same step to be patterned to the
same shape.
3. The ink jet recording head according claim 1,
wherein said electrode comprises a common electrode to a
pattern of said piezoelectric thin films and a separate
electrode for said separate piezoelectric thin film, and
wherein a projection area of said separate electrode opposite
to a surface of said common electrode is the same as an area
of surface of said separate piezoelectric thin film.
4. The ink jet recording head according to claim 1,
wherein said piezoelectric thin film is a thin film 0.3-5 μm
thick formed by a sol-gel method or a sputtering method.

5. The ink jet recording head according to claim 1, wherein said piezoelectric thin film is formed via said diaphragm on said ink chamber not reaching an outside of said ink chamber, and wherein a portion of said diaphragm in an area not attached to said piezoelectric thin film is thinner than a portion of said diaphragm in an area attached to said piezoelectric thin film.

6. The ink jet recording head according to claim 5, wherein said electrode comprises a common electrode to a pattern of said piezoelectric thin films and a separate electrode for said separate piezoelectric thin film, wherein said diaphragm comprises said common electrode and an insulating film, and wherein a portion of said common electrode not attached to said piezoelectric thin film is thinner than a portion of said common electrode attached to said piezoelectric thin film.

7. The ink jet recording head according to claim 5, wherein said electrode comprises a common electrode to a pattern of said piezoelectric thin films and a separate electrode for said separate piezoelectric thin film and wherein said diaphragm is made of said common electrode.

8. The ink jet recording head according to claim 5, wherein said electrode comprises a lower electrode and an

upper electrode for separate piezoelectric thin films, wherein said diaphragm comprises said lower electrode and an insulating film facing said ink pool, and wherein said lower electrode is formed and attached only to areas of piezoelectric thin films.

9. The ink jet recording head according to claim 8, wherein an area of said insulating film where said piezoelectric thin film is not formed is thinner than an area of said insulating film where said piezoelectric thin film is formed.

10. An ink jet recorder comprising an ink jet recording head as claimed in any one of claims 1 to 9.

11. A method for manufacturing an ink jet recording head, comprising the steps of:

(a) forming an ink pool for supplying ink to a nozzle for jetting ink on a substrate;

(b) forming on said substrate a diaphragm for pressurizing ink in said ink chamber, a piezoelectric thin film serving as a pressurization source for said diaphragm, and an electrode for said piezoelectric thin film in sequence; and

(c) patterning both of said piezoelectric thin film and said electrode at the same time.

12. The method according to claim 11, wherein said step (b) provides said electrode comprising a common electrode to a pattern of said piezoelectric thin films and a separate electrode for said separate piezoelectric thin film and makes a projection area of said separate electrode opposite to a surface of said common electrode the same as an area of surface of said separate piezoelectric thin film.

13. The method according to claim 12, wherein said step (c) dry-etches said separate electrode and said piezoelectric thin film in batch.

14. The method according to claim 13, wherein said dry etching is an ion milling method or a reactive ion etching method.

15. The method according to claim 11, wherein said step (b) includes forming said piezoelectric thin film 0.3-5 μm thick by a sol-gel method or a sputtering method.

16. The method according to claim 11, wherein said step (b) comprises the steps of depositing an insulating film onto a surface of said substrate, forming and attaching a first electrode, depositing a piezoelectric thin film onto said electrode, and depositing a second electrode onto said piezoelectric thin film and wherein said step (c) comprises

the steps of patterning a resist on said second electrode by photolithography, patterning said second electrode and said piezoelectric thin film with said resist as a mask by a first etching method, and thinning said first electrode by a second etching method.

17. The method according to claim 11, wherein said step (b) comprises the steps of depositing an insulating film onto a surface of said substrate, depositing a first electrode, depositing a piezoelectric thin film onto said electrode, and depositing a second electrode onto said piezoelectric thin film and wherein said step (c) comprises the steps of patterning a resist on said second electrode by photolithography, patterning said second electrode and said piezoelectric thin film with said resist as a mask by a first etching method, and removing a diaphragm area of said first electrode by a second etching method.

18. The method according to claim 11, wherein said step (b) comprises the steps of depositing an insulating film onto a surface of said substrate, depositing a first electrode, depositing a piezoelectric thin film onto said electrode, and depositing a second electrode onto said piezoelectric thin film and wherein said step (c) comprises the steps of patterning a resist on said second electrode by photolithography, patterning said second electrode and said

piezoelectric thin film with said resist as a mask by a first etching method, and removing an exposed diaphragm area of said first electrode by a second etching method and consecutively etching an insulating film of the diaphragm area for making the insulating film thinner than the initial insulating film.

19. The method as claimed in any one of claims 16 to 18 wherein said etching method includes irradiating the thin film with high-energy particles.

20. An ink jet recording head comprising:
a nozzle orifice for jetting ink;
an ink chamber communicating with said nozzle;
a diaphragm for pressurizing ink in said ink chamber;
a piezoelectric thin film on said diaphragm; and
an electrode for said piezoelectric thin film wherein
said piezoelectric thin film is formed via said diaphragm on
said ink chamber not reaching an outside of said ink chamber
and wherein a portion of said diaphragm in an area not
attached to said piezoelectric thin film is thinner than a
portion of said diaphragm in an area attached to said
piezoelectric thin film.